[7590-01-P]

NUCLEAR REGULATORY COMMISSION

[NRC-2020-0237]

Considerations for Estimating Site-Specific Probable Maximum Precipitation at Nuclear Power Plants in the United States of America

AGENCY: Nuclear Regulatory Commission.

ACTION: NUREG; issuance.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is issuing a knowledge management NUREG, NUREG/KM-0015**,** "Considerations for Estimating Site-Specific Probable Maximum Precipitation at Nuclear Power Plants in the United States of America." The NRC staff and Oak Ridge National Laboratory have prepared a reference document summarizing recent lessons-learned in connection with a review of the site-specific probable maximum precipitation (SSPMP) estimates used by some nuclear power plant owners and operators in connection with a recent re-evaluation of external flooding at their respective project sites.

DATES: NUREG/KM-0015 is available on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].**

ADDRESSES: Please refer to Docket ID **NRC-2020-0237** when contacting the NRC about the availability of information regarding this document. You may obtain publicly available information related to this document using any of the following methods:

- **Federal Rulemaking Website:** Go to https://www.regulations.gov and search for Docket ID **NRC-2020-0237**. Address questions about Docket IDs in Regulations.gov to Stacy Schumann; telephone: 301-415-0624; email: Stacy.Schumann@nrc.gov. For technical questions, contact the individual listed in the **FOR FURTHER INFORMATION CONTACT** section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):** You may obtain publicly available documents online in the ADAMS Public

Documents collection at https://www.nrc.gov/reading-rm/adams.html. To begin the search, select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. NUREG/KM-0015, "Considerations for Estimating Site-Specific Probable Maximum Precipitation at Nuclear Power Plants in the United States of America" is available in ADAMS under Accession No. ML21245A418.

- **Attention:** The PDR, where you may examine, and order copies of public documents, is currently closed. You may submit your request to the PDR via email at pdr.resource@nrc.gov or call 1-800-397-4209 or 301-415-4737, between 8:00 a.m. and 4:00 p.m. (ET), Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Kevin Quinlan, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-6809, email: Kevin.Quinlan@nrc.gov.

SUPPLEMENTARY INFORMATION:

I. Background

By letter dated March 12, 2012, the NRC issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status licensees to reevaluate seismic and external flooding for their sites against current Commission requirements and guidance. This request was made consistent with paragraph 50.54(f) of title of the *Code of Federal Regulations* (10 CFR), "Conditions of licenses." The request was issued in connection with implementing lessons-learned identified by the staff, and described in their Near-Term Task Force Report, following the 2011 accident at the Fukushima Dai-ichi nuclear power plant. In connection with this request, owners and operators were to re-evaluate flood hazards at their respective sites using present-day methods and regulatory guidance used by the NRC staff when reviewing 10 CFR part 52 applications for Early Site Permits and Combined Operating Licenses.

In response to the staff's 2012 § 50.54(f) information request, owners and licensees submitted about 60 external flood hazard re-evaluation reports (FHRRs) corresponding to the operating fleet of power reactors. In the matter of the probable maximum precipitation (PMP) value used for some of the flood-hazard re-evaluations (primarily the estimation of local intense precipitation and riverine-based floods), current NRC guidance documents recommend the use of the PMP estimation methods described in a series of Hydrometeorological Reports (HMRs) developed by the National Oceanographic and Atmospheric Administration (NOAA). The PMP event itself is generally defined as the greatest depth of precipitation for a given duration meteorologically possible for a design watershed or a given storm area at a particular time of year. The estimated PMP over a particular watershed or basin results in a flood magnitude for which there is virtually no risk of exceeding. The challenge, however, is that HMR-derived PMP estimates are based on methodologies and data which have not been updated with rainfall and storm events which have occurred in the decades since the HMRs were last published.

Upon review of the FHRRs, the staff found that about 26 project sites responding to the § 50.54(f) information request submitted PMP estimates that were not based on NOAA HMRs but were developed by a commercial interest. As part of the FHRR process, the staff conducted an audit of the commercial vendor who developed the site-specific PMP estimates to better-understand the technical basis underlying the approach. In all cases, these SSPMP estimates were less than those obtained from the applicable HMR. Although the development and estimation of the SSPMP studies reviewed by the staff generally followed processes similar to those described in the existing guidance, several different methods, data sources, assumptions, and procedures were used to obtain site specific results other than those found using the HMR methodology.

Based on the staff's § 50.54(f) review experience and in anticipation of its continued use, this NUREG summarizes the lessons-learned concerning the review and

application of a SSPMP. To that end, this NUREG addresses the following topics:

- Storm Selection
- Storm Reconstruction
- Storm Transposition
- Storm Representative Dew Point Selection
- Precipitable Water Estimation
- Dew Point Climatology, Moisture Maximization, and Moisture Transposition
- Terrain Adjustment
- Envelopment and Probable Maximum Precipitation Determination
- Spatial and Temporal Distributions for SSPMP Applications

This reference document describes the technical theory, data sources, and analysis methodology that could be used to derive a SSPMP estimate. Certain new terms are also introduced and defined. This reference document also identifies key technical (meteorological) considerations when reviewing a SSPMP estimate.

To date, there is no clear NRC guidance on this topic or a commonly agreed-to approach on the estimation of SSPMP. As the staff may be reviewing additional SSPMP estimates in the future in connection with its regulatory responsibilities, it was decided to elicit stakeholder views on the matters and approaches discussed in this draft document.

This document contains no regulatory guidance or regulatory positions.

A request for comments on draft NUREG/KM-0015, (ADAMS Accession No. ML20356A293) was published in the *Federal Register* on December 29, 2020 (85 FR 85683), with a 60-day comment period ending on March 1, 2021. Comments received on NUREG/KM-0015 can be found on the Federal Rulemaking website (https://www.regulations.gov) under Docket ID **NRC-2020-0237**.

II. Knowledge Management

Since its inception, the Atomic Energy Commission and its successor, the NRC, have focused on preserving the (explicit) documentary record of its decision-making in the form of NUREGs, SECY Papers, Regulatory Guides, and other documents.

However, in 2006, the agency recognized that there was a need to engage in a more-formal program of knowledge management that also reflects the less-tangible (implicit) human capital aspect of the agencies' knowledge base. This feature was particularly important as the agency enters its fifth decade of operation – a period characterized by an increasing number of retirements among long-serving staff involved in many of the agencies' early regulatory programs and associated licensing actions. Staff efforts thus far in preserving this legacy of experience that describe important historical events, facts, and research that were instrumental in shaping NRC's regulatory programs, can be found at https://www.nrc.gov/reading-rm/doc-collections/nuregs/knowledge/.

The purpose of this knowledge management NUREG (or NUREG/KM) is intended to satisfy an NRC goal of maintaining and preserving knowledge concerning the lessons-learned from the recent flood hazard re-evaluations at current and planned nuclear power plant sites performed most recently in connection with the staff 2012 § 50.54(f) reviews.

Dated: September 8, 2021.

For the Nuclear Regulatory Commission.

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